



National Water Census

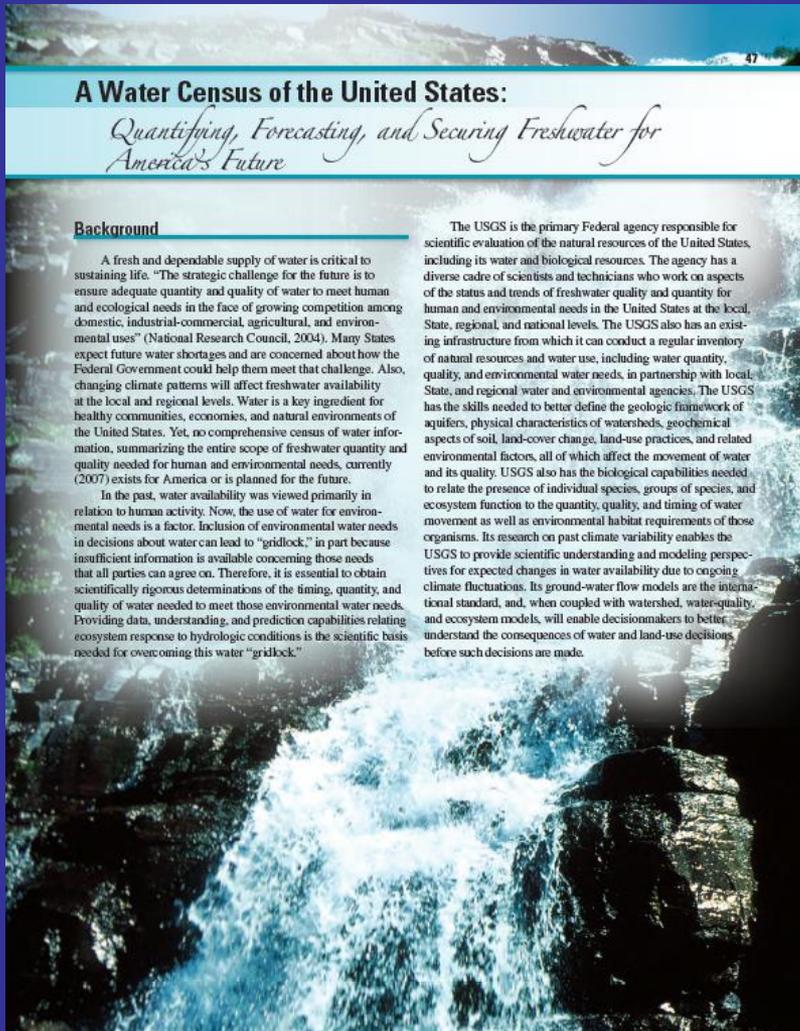
Apalachicola-Chattahoochee-Flint Rivers

Focus Study * Part of the



Initiative

A Water Census is part of our plan!



A Water Census of the United States:
Quantifying, Forecasting, and Securing Freshwater for America's Future

Background

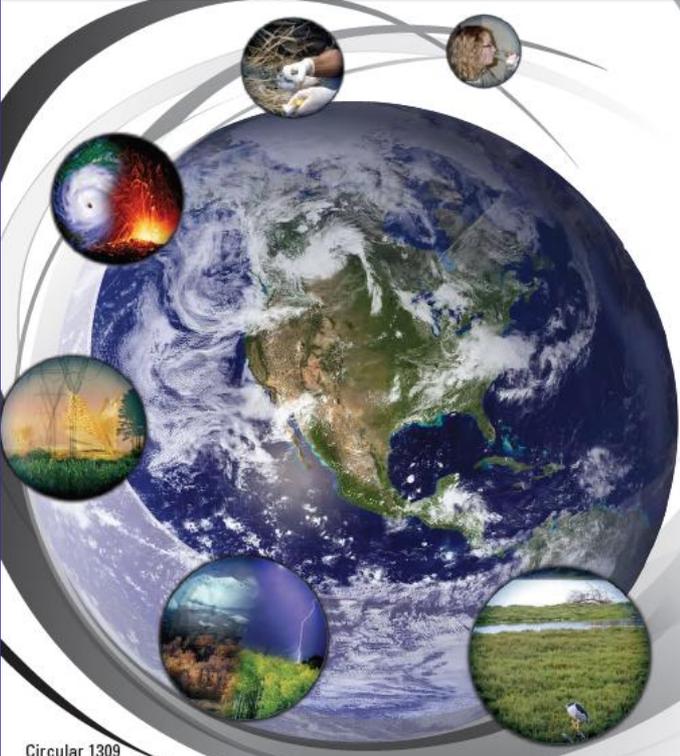
A fresh and dependable supply of water is critical to sustaining life. "The strategic challenge for the future is to ensure adequate quantity and quality of water to meet human and ecological needs in the face of growing competition among domestic, industrial-commercial, agricultural, and environmental uses" (National Research Council, 2004). Many States expect future water shortages and are concerned about how the Federal Government could help them meet that challenge. Also, changing climate patterns will affect freshwater availability at the local and regional levels. Water is a key ingredient for healthy communities, economies, and natural environments of the United States. Yet, no comprehensive census of water information, summarizing the entire scope of freshwater quantity and quality needed for human and environmental needs, currently (2007) exists for America or is planned for the future.

In the past, water availability was viewed primarily in relation to human activity. Now, the use of water for environmental needs is a factor. Inclusion of environmental water needs in decisions about water can lead to "gridlock," in part because insufficient information is available concerning those needs that all parties can agree on. Therefore, it is essential to obtain scientifically rigorous determinations of the timing, quantity, and quality of water needed to meet those environmental water needs. Providing data, understanding, and prediction capabilities relating ecosystem response to hydrologic conditions is the scientific basis needed for overcoming this water "gridlock."

The USGS is the primary Federal agency responsible for scientific evaluation of the natural resources of the United States, including its water and biological resources. The agency has a diverse cadre of scientists and technicians who work on aspects of the status and trends of freshwater quality and quantity for human and environmental needs in the United States at the local, State, regional, and national levels. The USGS also has an existing infrastructure from which it can conduct a regular inventory of natural resources and water use, including water quantity, quality, and environmental water needs, in partnership with local, State, and regional water and environmental agencies. The USGS has the skills needed to better define the geologic framework of aquifers, physical characteristics of watersheds, geochemical aspects of soil, land-cover change, land-use practices, and related environmental factors, all of which affect the movement of water and its quality. USGS also has the biological capabilities needed to relate the presence of individual species, groups of species, and ecosystem function to the quantity, quality, and timing of water movement as well as environmental habitat requirements of those organisms. Its research on past climate variability enables the USGS to provide scientific understanding and modeling perspectives for expected changes in water availability due to ongoing climate fluctuations. Its ground-water flow models are the international standard, and, when coupled with watershed, water-quality, and ecosystem models, will enable decisionmakers to better understand the consequences of water and land-use decisions before such decisions are made.



Facing Tomorrow's Challenges—
U.S. Geological Survey Science in the Decade 2007–2017



Circular 1309

U.S. Department of the Interior
U.S. Geological Survey

Our objective for the Water Census:

To place technical information and tools in the hands of stakeholders, allowing them to answer two primary questions about water availability:

Does the Nation have enough freshwater to meet both human and ecological needs?

Will this water be present to meet future needs?

Water Availability Analysis

The process of determining the quantity and timing-characteristics of water, which is of sufficient quality, to meet both human and ecological needs.

Water Availability Analysis

Technical Information

Socio-economic Considerations

Legal Considerations

Regulatory Considerations

Political Considerations

USGS only deals with the Technical Information!

What is



A Department of the Interior initiative on water availability and conservation.
-Office of the Ass't. Sec. for Water and Sci.



The National Water Census

- River Basin Supply and Demand Studies
- Title XVI Program
- WaterSMART Grants

How did we get to where we are today?

2002



2005

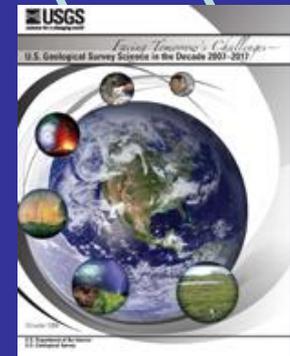


2011

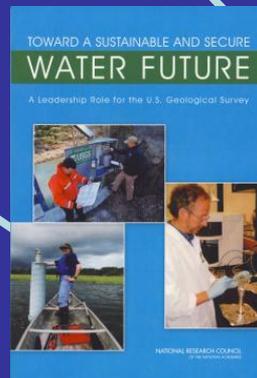


Water Availability and Use Assessment

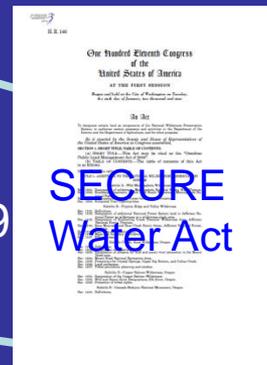
2007



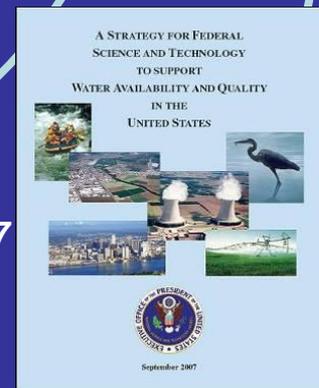
2009



2009



2007



**P.L. 111-11 Subtitle F
(SECURE Water Act as signed by the President March 30, 2009)**

Section 9501: Findings

Section 9502: Definitions

Section 9503: Reclamation Climate Change and Water Program

Section 9504: Water Management Improvement

Section 9505: Hydroelectric Power Assessment

Section 9506: Climate Change and Water Intergovernmental Panel

**Section 9507: Water Data Enhancement by United States
Geological Survey**

Full National Streamflow Information Program.

Creates a National Groundwater Resources Monitoring Program and a Brackish Groundwater Assessment.

Section 9508: Water Availability Assessments

Creates a national program to study water quality and quantity.

Requires first report in 2012 and every 5 years thereafter.

Grants are available to assist state agencies in developing and integrating state water use data.

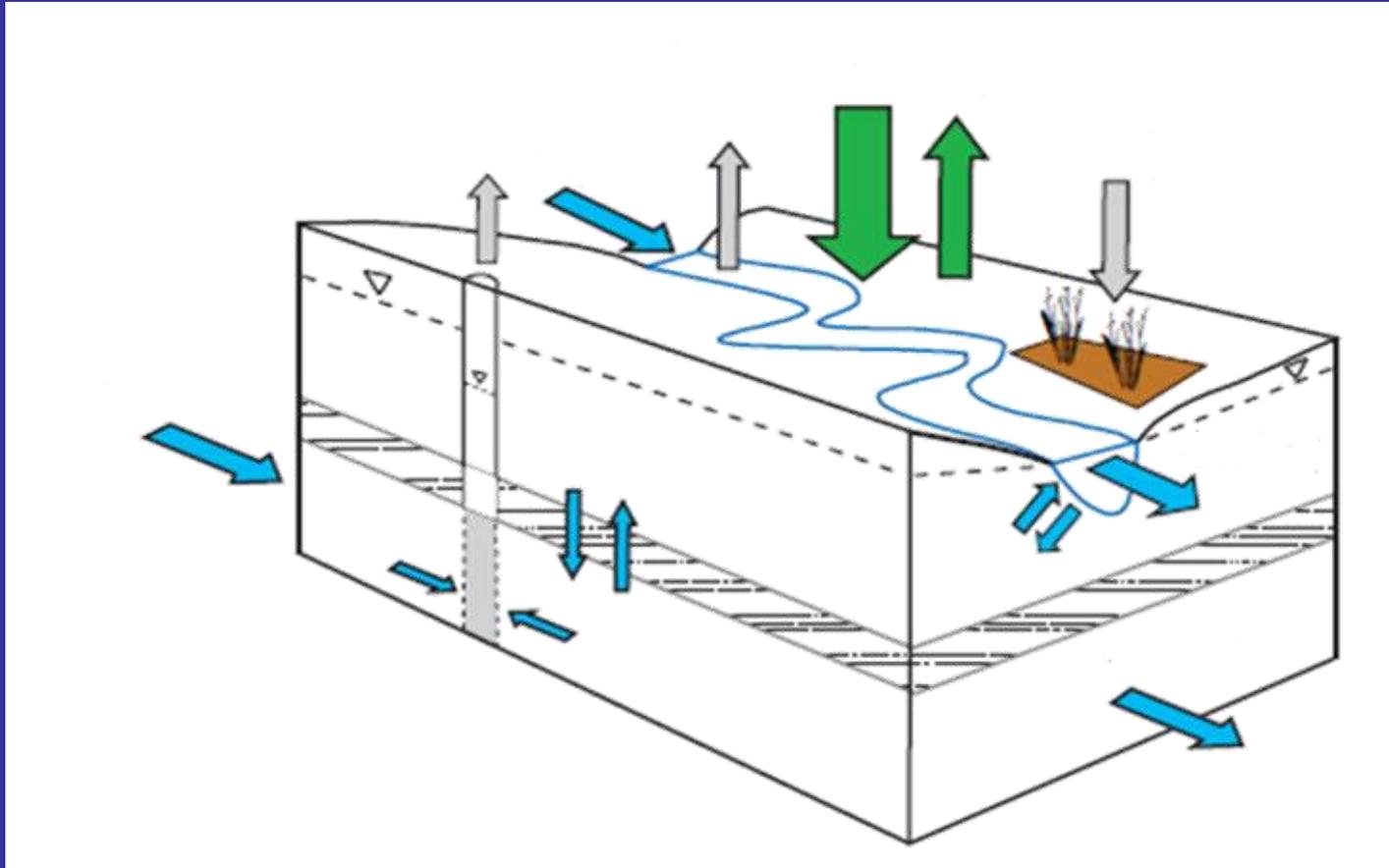
Section 9509: Research Agreement Authority

Section 9510: Effect

Report to Congress - Every 5 years thereafter:

1. The **current availability** of water resources in the United States,
2. **Significant trends** affecting water **availability**, including documented or projected impacts as a result of global climate change,
3. The **withdrawal and use** of surface water and groundwater by various sectors,
4. **Significant trends** relating to each **water use** sector, including significant changes in water use due to the development of new energy supplies,
5. **Significant water use conflicts or shortages** that have occurred or are occurring,
6. Each **factor** that has **caused**, or is causing, a conflict or shortage.

Account for water with a “budget”



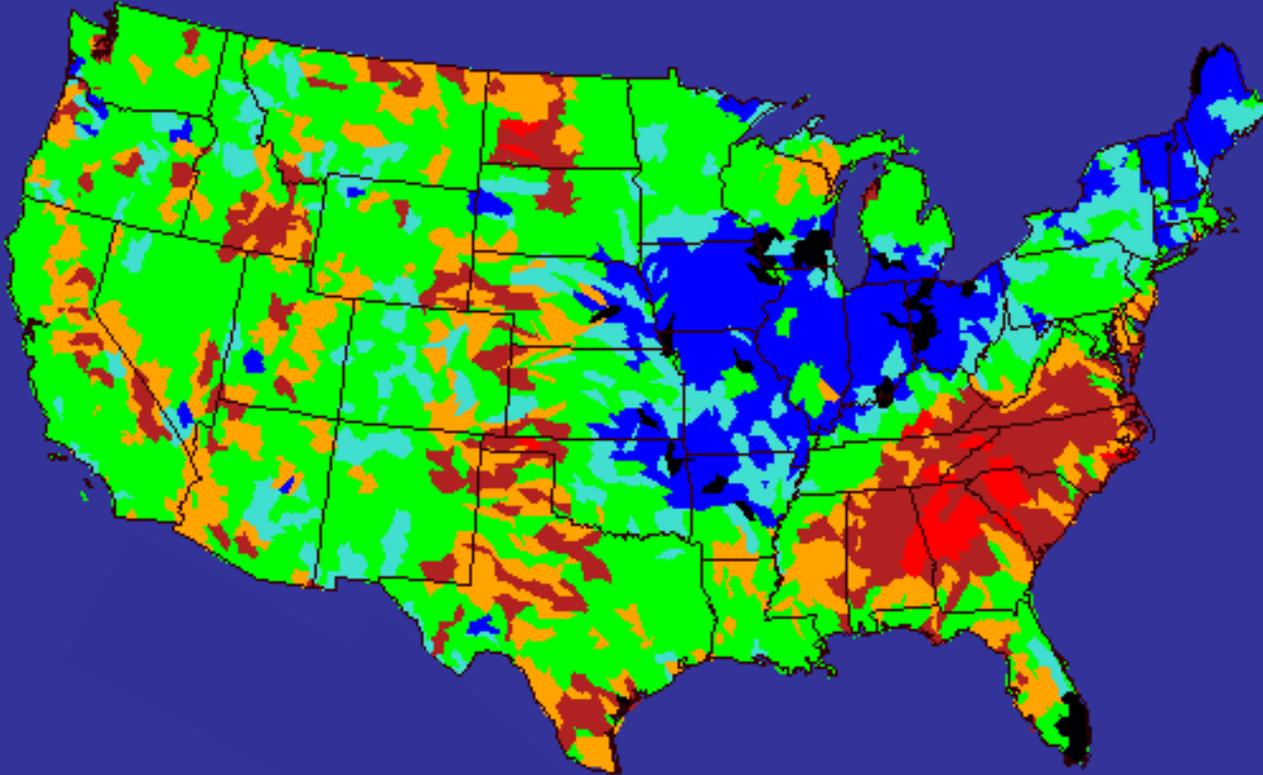
$$P + Q_{in} = ET + \Delta S + Q_{out}$$

$$P + Q_{swin} + Q_{gwin} = ET_{sw} + ET_{gw} + ET_{uz} + \Delta S_{sw} + \Delta S_{snow} + \Delta S_{uz} + \Delta S_{gw} + Q_{gwout} + RO + Q_{bf}$$

A Nationwide System to deliver water accounting information addressing

- Precipitation
- Evapotranspiration
- Storage in Reservoirs, Lakes, Snow and Ice
- Surface Water
- Groundwater
 - Recharge rates
 - Water level in aquifers
- Ecological Needs
- Water Withdrawals
- Return Flows
- Consumptive Uses
- Run-of-the-River Uses

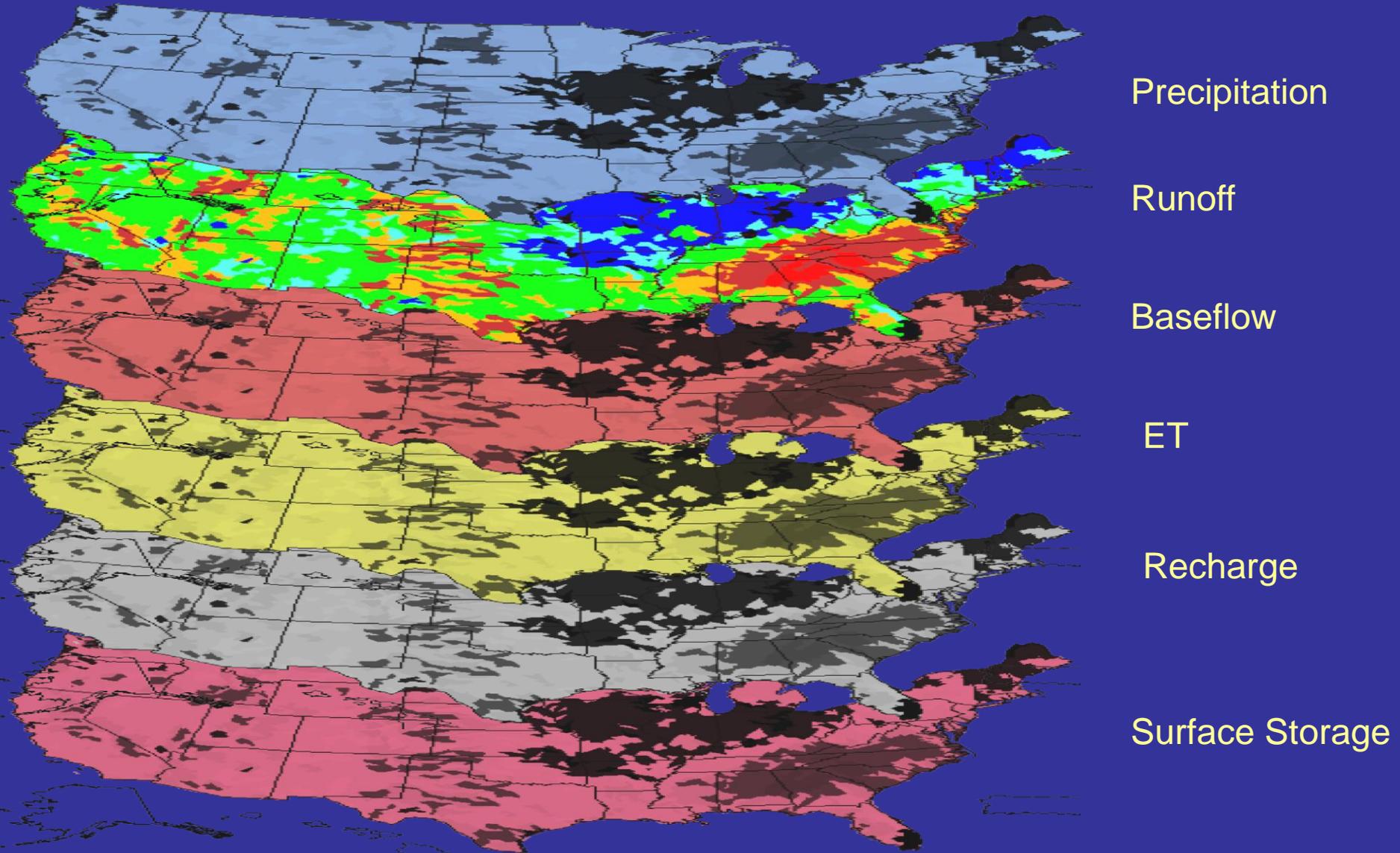
Generating and delivering information for water accounting



Envision a seamless coverage of information for
a water accounting component

<http://waterwatch.usgs.gov/new/index.php>

And if you could get that info for all accounting components



Information Delivery

A web application for delivering water availability information at scales that are relevant to the user

USGS
Idaho StreamStats

ZoomIn ZoomOut Pan GetInfo FullExtent LastExtent EditBasin FlowStats BasinChar ClearBasin Download GageInfo Print Help

Scale
Zoom To: water GO
Enter Water Resource

Map Layers Locator Map
BASE LAYERS
WATER
POLITICAL

USGS Scale 1:7627084

Accessibility FOIA Privacy Policies and Notices
U.S. Department of the Interior | U.S. Geological Survey
URL: <http://streamstats.usgs.gov/idstreamstats/>
Page Contact Information: StreamStats Help
Page Last Modified: September 17, 2007

Streamstats Status News ⚠️

FIRST GOV .GOV
The U.S. Government's Official Web Portal

TAKE PRIDE IN AMERICA

Select the area of interest.

Generate information on water accounting components

Work with the online tool to construct your water budget

Access trend information

Estimating Flows at Ungaged Areas – Selection of models

Drainage-area ratio

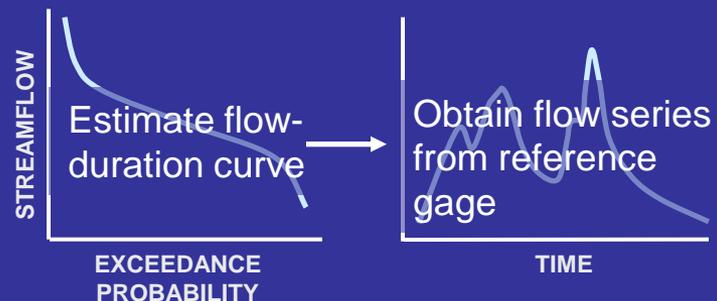
$$Qu_t = \frac{Au}{Ag} Qg_t$$

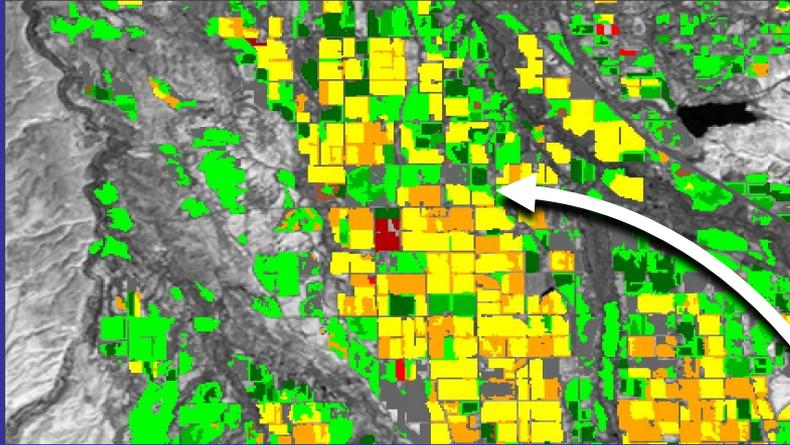
Scaling by the at-site
mean and variance
(Hirsch, 1979)

$$Qu_t = \hat{\mu}_u + \hat{\sigma}_u \left(\frac{Qg_t - \hat{\mu}_g}{\hat{\sigma}_g} \right)$$

Non-linear spatial
interpolation

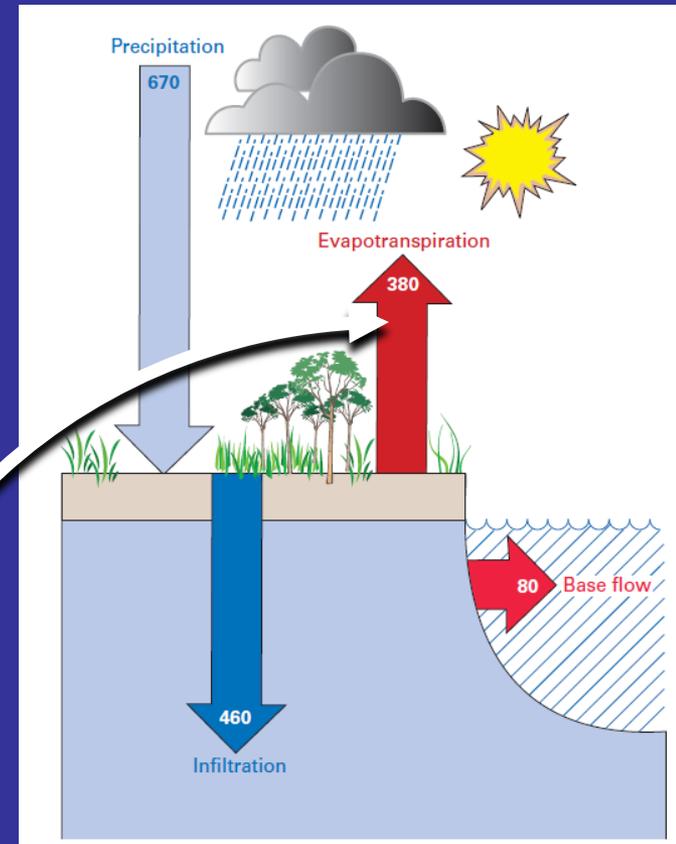
(Fennessey, 1994; Smakhtin, 1999;
Smakhtin et al. 1997, Mohamoud,
2008; Archfield and others, 2010)





ET

Water Use Effort:
For irrigation water use to
estimate consumptive use.

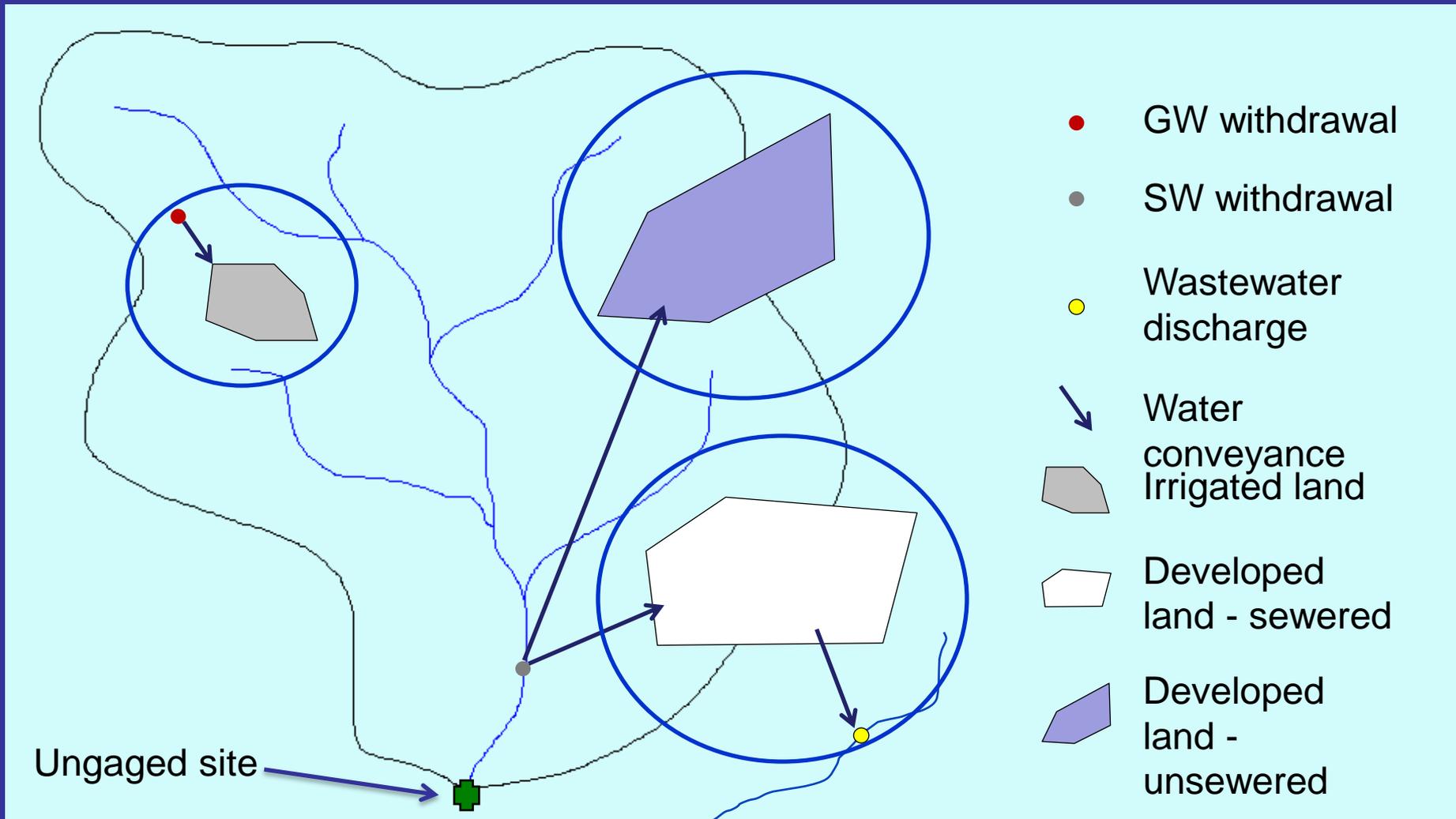


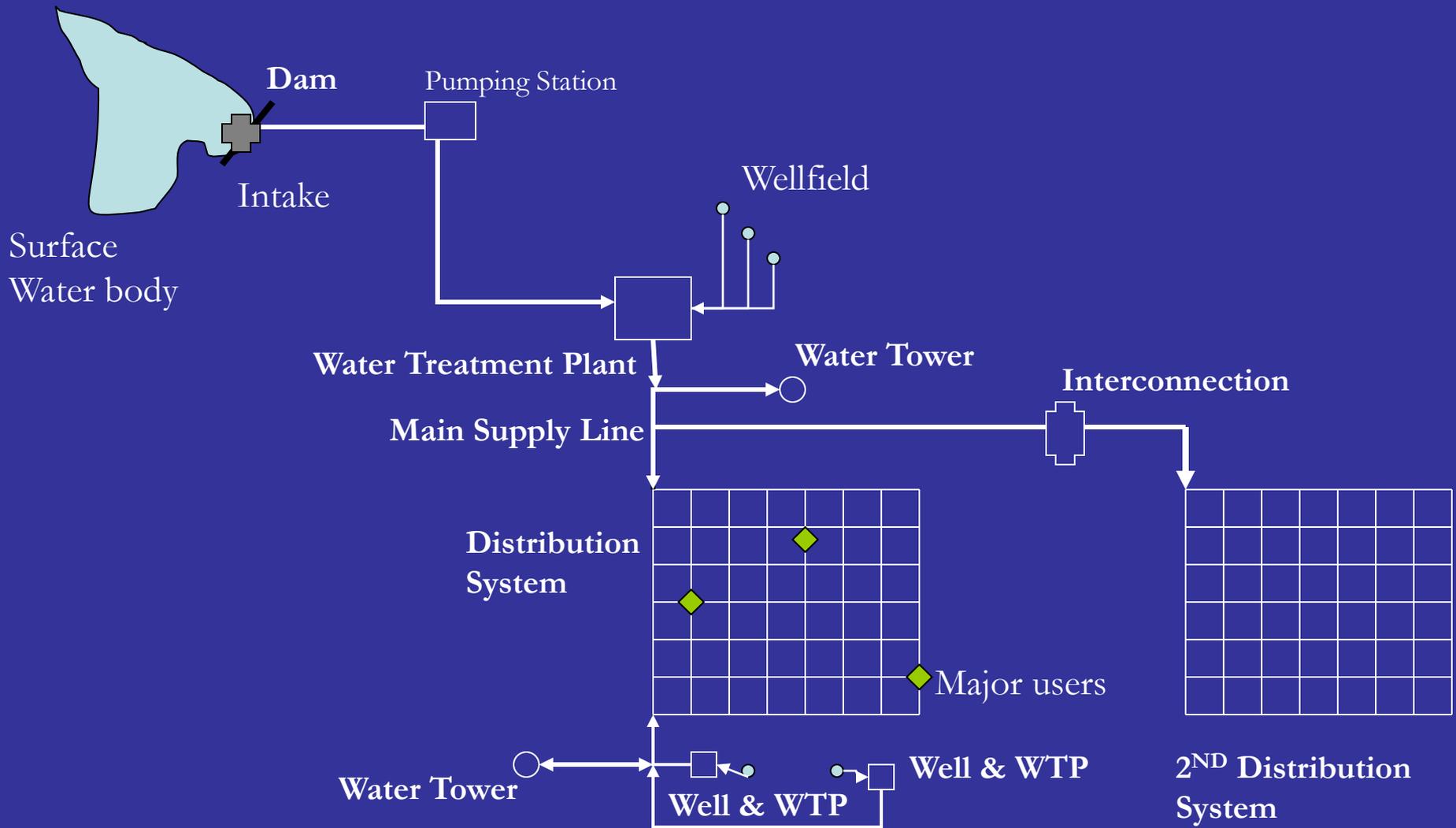
Water Budget Effort:
Total ET as a component of
the water budget.

Small Watershed Scale

USGS Concept: Conveyance

Water-Use Tracking includes interbasin transfer tracking





PUBLIC WATER SUPPLY SYSTEM

Thermoelectric Withdrawals



An aerial photograph of a large industrial power plant. Several tall smokestacks are visible, each emitting a thick, white plume of smoke that rises into the sky. The plant itself is a complex of structures situated in a rural area with green fields and some buildings. The sky is filled with heavy, grey clouds, and the overall lighting is somewhat dim, suggesting an overcast day. The text 'The new frontier - CONSUMPTION' is overlaid in white at the bottom of the image.

The new frontier -
CONSUMPTION

Water Use

Livestock



Less than 1 percent

Self-Supplied Domestic



1 percent

Public Supply

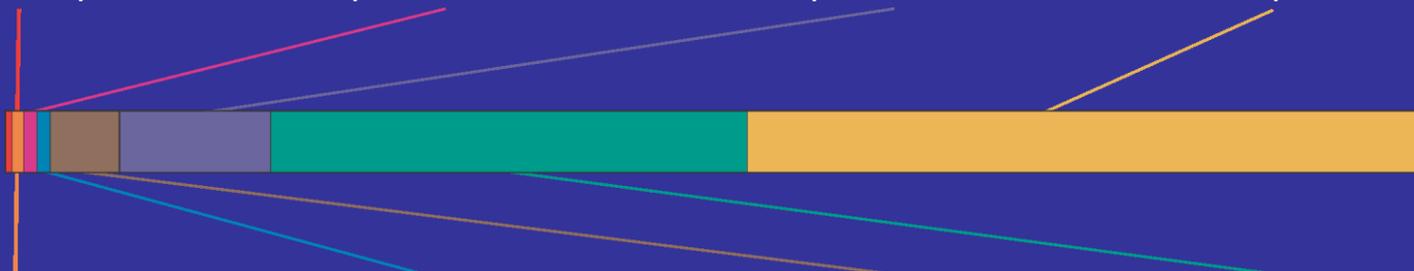


11 percent

Thermoelectric Power



49 percent



1 percent



Mining

2 percent



Aquaculture

4 percent



Self-Supplied Industrial

31 percent



Irrigation



1950



1955



1960



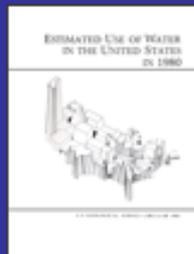
1965



1970



1975



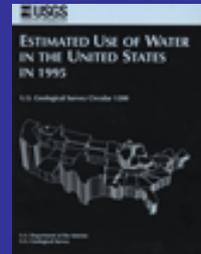
1980



1985



1990



1995



2000



2005

“These reports, “Estimated Water Use in the United States,” have been published every five years since 1950 and are one of the most widely cited publications of the USGS.”

Flows Needs for Wildlife and Habitat

- Assist classifying water bodies for their hydro-ecological type
- Provide tools and data to systematically assess the ecological affects of hydrologic alteration
- Assist users to develop flow or water level alteration – ecological response relationships by type of water body



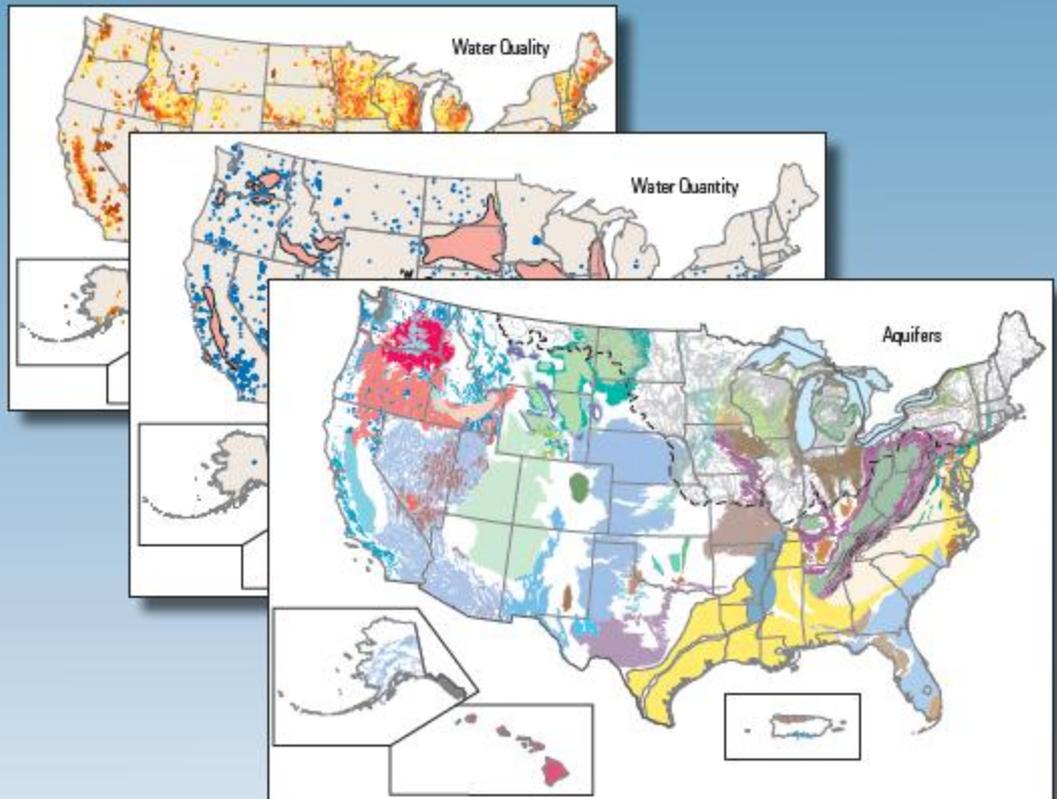
Assess Groundwater's role in Water Availability

Use the strength of and enhance the resources within this program to provide the information on:

- Recharge
- GW yields
- Changes in storage.
- Trends in GW Indices
- GW/SW Interactions

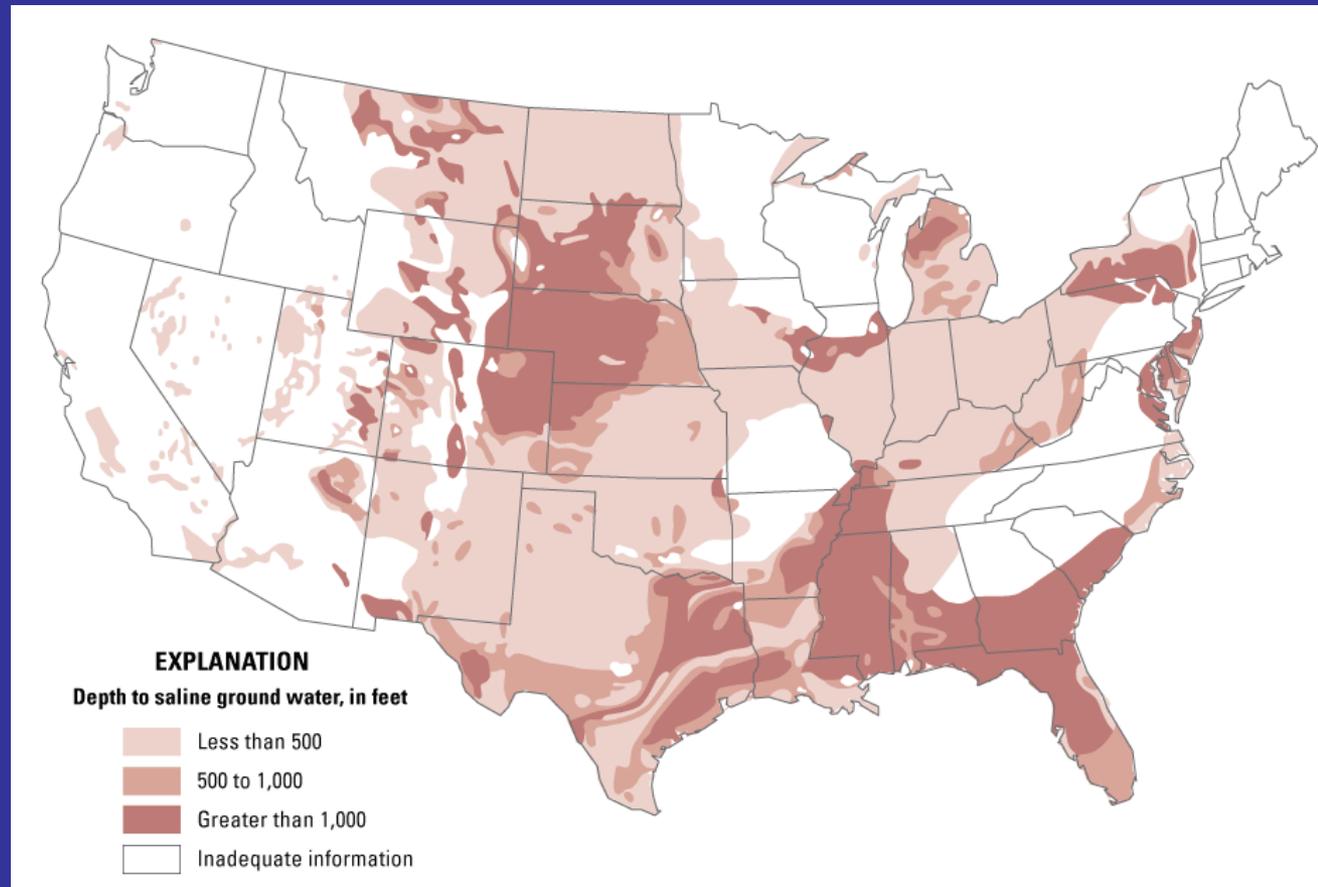
Ground-Water Resources Program

Ground-Water Availability in the United States



Assess the Nation's Brackish Resources

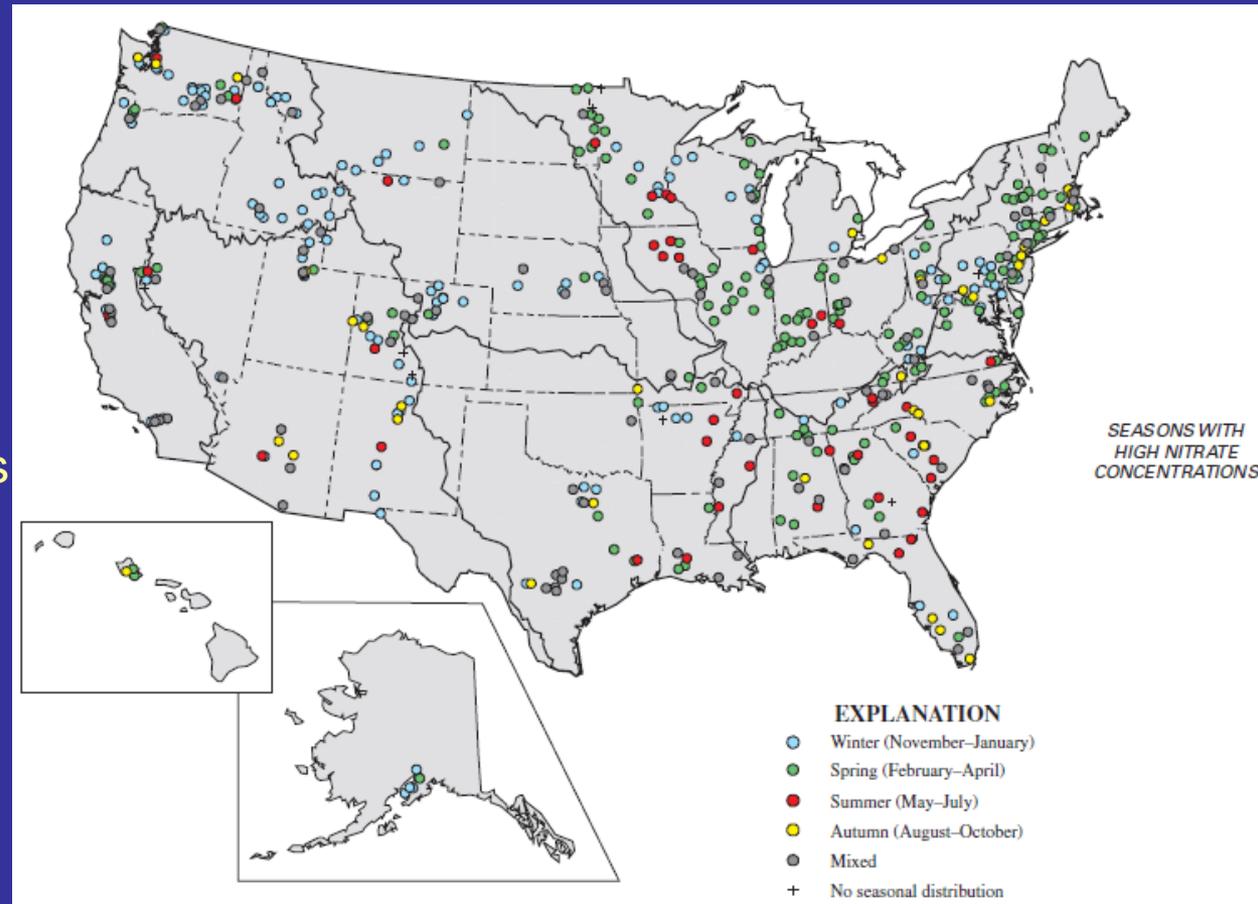
- Locations of the res.
- Hydrologic properties
- Water quality properties
- Current uses



Assess Water Quality's role in Water Availability

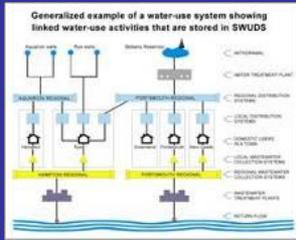
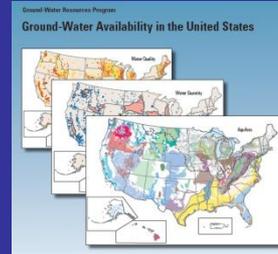
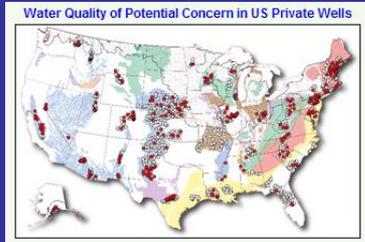
Use the strength of USGS Water Quality programs to:

- Demonstrate the degree of water quality impairment that limits water availability.
- Define the main compounds of importance.
- Relate to water use and return flows.
- Trends.



Finally, three studies focused on selected watersheds: the Colorado River, the Delaware River, and the ACF Rivers - where there is significant competition over water resources. Here, the USGS will work collaboratively with stakeholders to comprehensively assess the technical aspects of water availability.

Focused Water Availability Assessments



Water Quality

Groundwater Resources



Surface Water Trends, Precipitation, etc

Water Use



Global Change

State, Local, Regional Stakeholder Involvement



Defined Technical Questions to be Answered

Water Availability Stresses

Delaware

Serving 15 million people

Two Supreme Court Decrees

Endangered Aquatic Species

Natural Gas Development

Apalachicola- Chattahoochee- Flint

Competition over resource

Fast growing population

Public Supply - Ag - Energy

Ecological Water Needs

Colorado

Fast growing population

Energy development

Backbone of Hydropower

Declining River Flows

What we will do in Focus Area Studies

- Answer the questions that the SECURE Water Act asked.
- Work with Basin Stakeholders to develop a technical water availability study that will benefit local and national needs.
- Work collaboratively with on-going Basin water availability efforts to complement those efforts. Build off of the Flint River “thrust project” and the SERAP program.
- Primary audience: resource managers within the Basin who deal with water, biological, and land use resources.

What we would like from Focus Area Studies

- Use the Focus Area Studies as test-beds to demonstrate techniques that USGS can scale up to the national level within the next 10 years.
- Examples of demonstrations to be done:
 - Model testing and selection for flows for ungaged areas
 - Approaches for ecological water science
 - Approaches for water use science

How will we apply 2012 - 2014 funds?

ACF Focus Area Study:

Hydrologic Networks and Analysis \$500,000

each year for three consecutive years to carry out the study of the basin. Total study funds = \$1.5 M

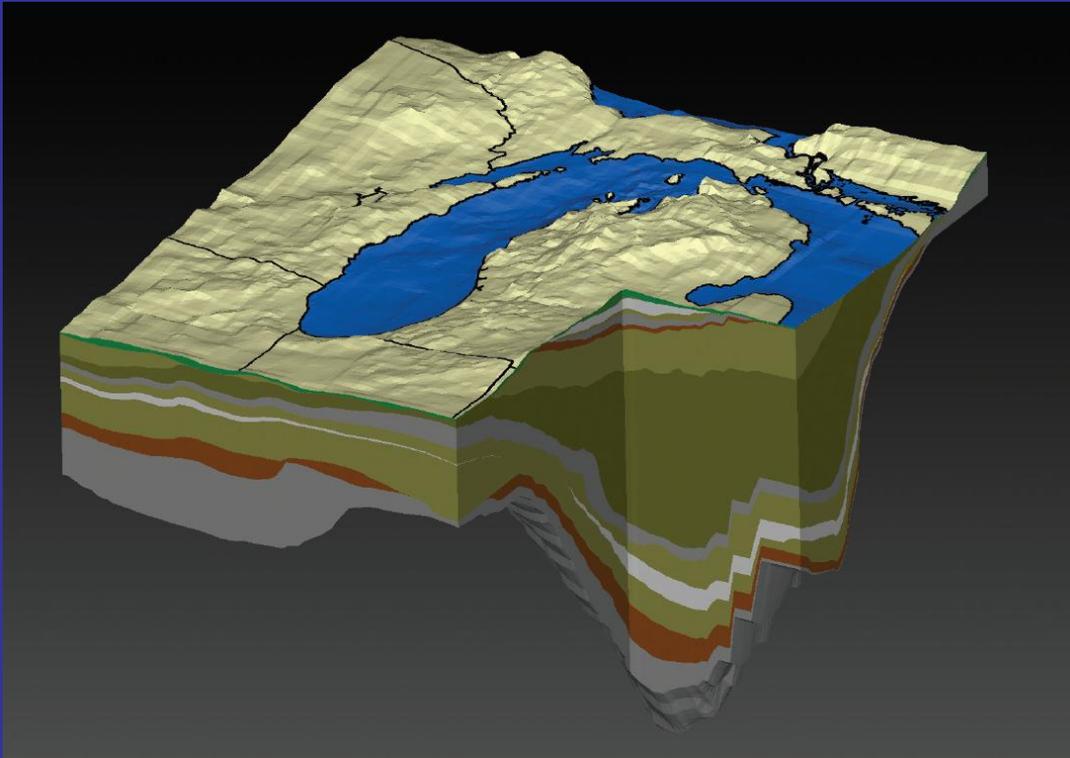
GREAT LAKES BASIN PILOT PROJECT



<http://water.usgs.gov/wateravailability/greatlakes>

National Emphasis—Regional Focus

- Develop methods applicable to national program
- Respond to Great Lakes issues—Compact



<http://water.usgs.gov/wateravailability/greatlakes>

USGS
National Water Availability and Use Program

Relationships Between Wetland, Wetland Flow, and Contents of Water in Sheds and Sediments, with Collected Data To Wisconsin, 1999-2004



Scientific Investigations Report 2009-5186
U.S. Department of the Interior
U.S. Geological Survey

USGS
National Water Availability and Use Program

Consumptive Water-Use Coefficients for the Great Lakes Basin and Climatologically Similar Areas



Scientific Investigations Report 2007-5197
U.S. Department of the Interior
U.S. Geological Survey

USGS
National Water Availability and Use Program

Consumptive Water Use in the Great Lakes Basin

Introduction

Consumptive water use is defined as the water that is withdrawn from a water body and does not return to the water body in the same form and location. Consumptive water use is a critical component of the water cycle and is a key indicator of water availability. This report provides a comprehensive overview of consumptive water use in the Great Lakes Basin, including a description of the data sources, methods used to estimate consumptive water use, and a discussion of the results. The report also includes a map of the Great Lakes Basin showing the distribution of consumptive water use.



Scientific Investigations Report 2009-5188
U.S. Department of the Interior
U.S. Geological Survey

USGS
National Water Availability and Use Program—Great Lakes Basin Pilot

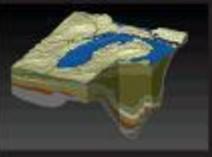
Application Guide for AFINCH (Analysis of Flows in Networks of Channels) Described by NHDPlus



Scientific Investigations Report 2009-5189
U.S. Department of the Interior
U.S. Geological Survey

USGS
National Water Availability and Use Program

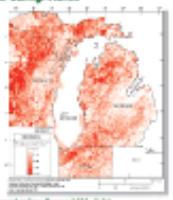
Hydrologic Framework of Bedrock Units and Initial Salinity Distributions for a Simulation of Groundwater for the Lake Michigan Basin



Scientific Investigations Report 2009-5190
U.S. Department of the Interior
U.S. Geological Survey

USGS
National Water Availability and Use Program

Processing, Analysis, and General Evaluation of Wetland Data for the Hydrologic Framework of the Great Lakes Basin



Scientific Investigations Report 2009-5191
U.S. Department of the Interior
U.S. Geological Survey

USGS
National Water Availability and Use Program

Estimates of Ground Water in Storage in the Great Lakes Basin, United States, 2006



Scientific Investigations Report 2008-5192
U.S. Department of the Interior
U.S. Geological Survey

USGS
National Water Availability and Use Program

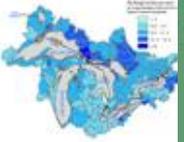
Compilation of Regional Ground-Water Divides for Principal Aquifers Corresponding to the Great Lakes United States



Scientific Investigations Report 2008-5193
U.S. Department of the Interior
U.S. Geological Survey

USGS
In cooperation with the National Water Research Institute, Environment Canada
National Assessment of Water Availability and Use Program

Estimation of Shallow Ground-Water Recharge Great Lakes Basin



Scientific Investigations Report 2005-5194
U.S. Department of the Interior
U.S. Geological Survey

USGS
National Water Availability and Use Program

Lake-Level Variability and Water Availability in the Great Lakes



Circle 1011
U.S. Department of the Interior
U.S. Geological Survey

USGS
National Water Availability and Use Program

Great Lakes Basin Water Availability and Use

A part of the National Assessment of Water Availability and Use Program

Introduction

Water Availability and Use in the Great Lakes Basin

Water Availability and Use in the Great Lakes Basin



Scientific Investigations Report 2007-5195
U.S. Department of the Interior
U.S. Geological Survey

USGS
National Water Availability and Use Program

Historical Changes in Precipitation and Streamflow in the U.S. Great Lakes Basin, 1915-2004



Scientific Investigations Report 2007-5196
U.S. Department of the Interior
U.S. Geological Survey

The objective is to place technical information and tools into the hands of our stakeholders to answer the questions they are facing about water availability.



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